MULTIMEDIA UNIVERSITY

STUDENT ID NO

TABLE NO:

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2022/2023

PMT0201 – MATHEMATICS II

(All sections / Groups)

4 OCTOBER 2023
9.00 a.m. – 11.00 a.m.
(2 Hours)

Question	Marks
1	
2	
3	
4	
Total	

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 11 **pages** only including the cover page with **4 Questions**.
2. Attempt **ALL FOUR** questions. The distribution of the marks for each question is given.
3. Write your answers on the question paper provided.
4. Show proper steps.

Question 1 (10 Marks)

(a) Let $P\left(x, -\frac{5}{7}\right)$ be a point in Quadrant III on a unit circle centered at the origin.

(i) Find the value of x in P. **[1.5 marks]**

(ii) If t is the distance along the unit circle revolved in a counterclockwise direction starting from the point (1, 0) and ending at the point P. Find $\cot(t)$ **[1 mark]**

(b) (i) Express $\tan\theta$ in terms of $\sin\theta$. **[1 mark]**

(ii) If θ is an angle in Quadrant II and $\sin\theta = \frac{2}{5}$, find the exact value of $\tan\theta$. **[1.5 marks]**

Continued...

(c) Given that $y = 2\sin\left(\frac{x}{2} - \frac{\pi}{8}\right) + 2$. **[2+1+2 marks]**

(i) Find the amplitude, period, phase shift and vertical shift of the given y.

(ii) Sketch one complete period of $g(x) = 2\sin\left(\frac{x}{2}\right)$ starting from $x = 0$.

(iii) On the same axes, sketch a complete period of the function $y = 2\sin\left(\frac{x}{2} - \frac{\pi}{8}\right) + 2$. State clearly all the x and y intercepts.

Continued...

Question 2 (15 Marks)

(a) Let $\theta = \cos^{-1}\left(-\frac{5}{7}\right)$. Graph θ in an xy-plane. Then without calculator, find the exact value of $\tan\left(\cos^{-1}\left(-\frac{5}{7}\right)\right)$. **[3 marks]**

(b) (i) Show that $\frac{1-\cos 2x}{\sin 2x} = \tan x$ **[2.5 marks]**

(ii) From (i) solve $\frac{1-\cos 2x}{\sin 2x} = \sqrt{3}$ **[1.5 marks]**

Continued...

(c) ABC is triangle with $b = 16$, $c = 20$, and $\angle A = 44^{\circ}$. **[1+3 marks]**

(i) Sketch the triangle ABC.

(ii) Solve the triangle ABC. Round your answers to **four** decimal places.

Continued...

(d) Given that complex number $z = 1 - \sqrt{3}\,i$. **[0.5+1.5+2 marks]**

(i) Graph z on the complex plane.

(ii) Then find the polar form of z.

(iii) Use **De Moivre's Theorem** to find z^7. Leave the answer in the form of $a + bi$ where a, b $\in$ R.

Continued...

Question 3 (15 Marks)

(a) Find the limits. Show at least two intermediate steps involving limits.

(i) $\lim_{x \to -3} \frac{2x^2+5x-3}{x^2-9}$ (ii) $\lim_{x \to \infty} \frac{5x^2+x}{2x^2+1}$ **[1.5+1 marks]**

(b) Suppose $f(x) = \begin{cases} \sqrt{3x+3}, & if \ x < 2 \\ 4 - \sin\left(\frac{\pi x}{4}\right), & if \ x \geq 2 \end{cases}$

Determine whether f is continuous at 2. Show proper steps. **[2.5 marks]**

Continued...

(c) Let $g(x) = x^2 + 4$.

Use the **formal definition** of derivative to find $g'(3)$. **[3 marks]**

(d) Find the derivatives of $p(x)$ and $q(x)$. Show proper steps.

(i) $p(x) = xe^{-2x}$ (ii) $q(x) = \frac{1}{2\cos(x)+1}$ **[1.5+1.5 marks]**

Continued...

(e) Let $h(x) = 4x^3 - 15x^2 - 18x + 5\,, \quad -1 \leq x \leq 2$

(i) Find the values of h at the critical number(s) and the end points for the given domain. **[3 marks]**

(ii) From (i), determine the absolute maximum and minimum values of the function h. **[1 mark]**

Continued...

Question 4 (10 Marks)

(a) Evaluate the integral $\int_1^3 \frac{6x-1}{\sqrt{3x^2-x}}dx$. **[3 marks]**

(b) Use **integration by parts** to find $\int x \ln(3x)dx$. **[3 marks]**

Continued...

(c) Given the curves $y = 4x - x^2$ and $y = x - 4$.

(i) On the same axes, sketch the graphs and find the points of intersections between the curves. **[2 marks]**

(ii) Find the area of region enclosed by the two curves. **[2 marks]**

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